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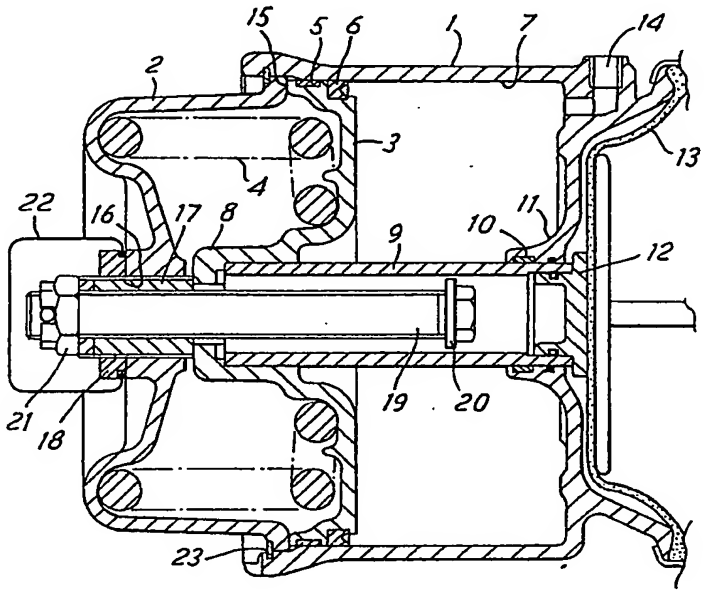
# (54) Fluid pressure actuator

(57) In a spring brake actuator provided with a wind-off bolt 19 an adjustable stop 17 is provided against which the centre 8 of a piston 3 can engage at the same time as the periphery of the piston engages a stop 15 so as to avoid stresses which may otherwise be produced.

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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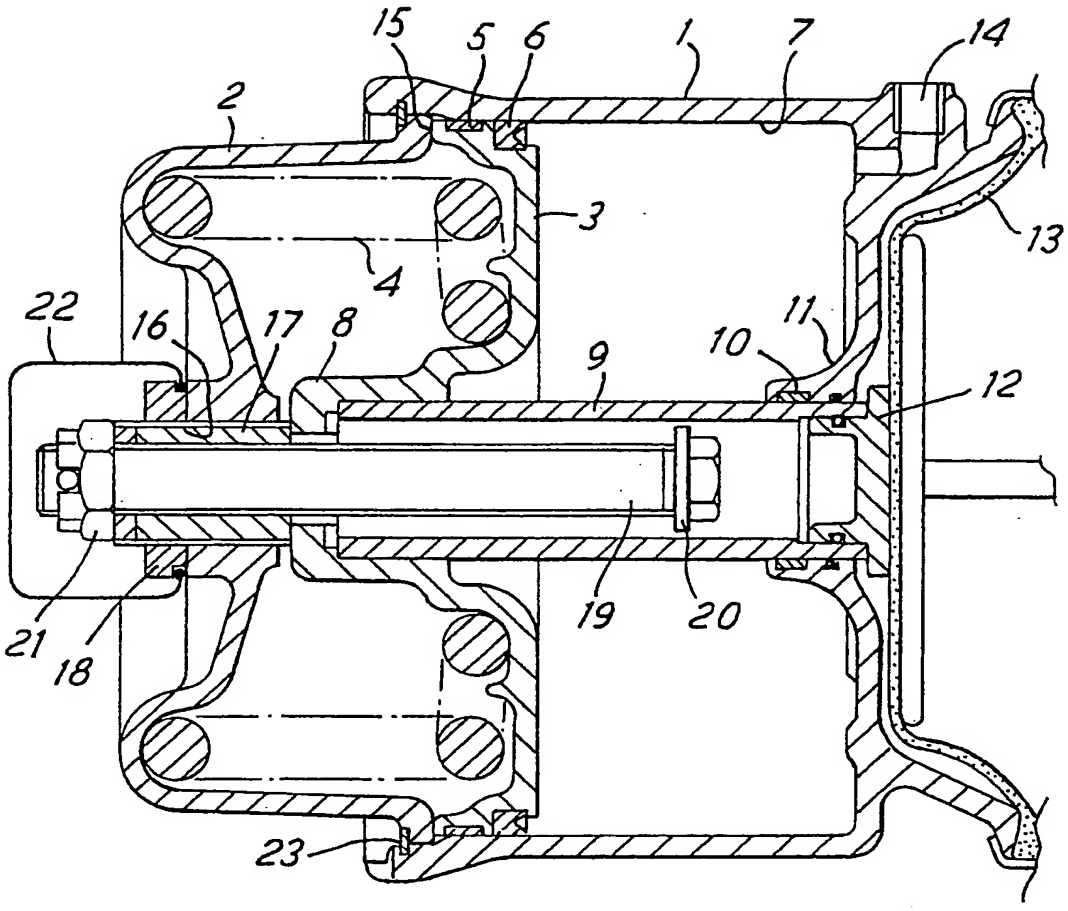

SPECIFICATION

**Improvements to fluid pressure operable actuators**

This invention relates to fluid pressure operable actuators and relates particularly to spring actuators.

Spring actuators are well known for use in braking systems for which application they usually comprise a spring-loaded piston which is moveable in a cylindrical housing in response to fluid pressure acting on the piston to oppose the force of the spring. Since a braking application is thus effected by reducing or moving the fluid pressure whereby spring force is applied to a brake linkage, it is desirable to provide a manually operable mechanical wind-off or other release mechanism to enable the linkage to be unburdened of the force of the spring when a brake release is required and no fluid pressure is available.

The components of such an actuator are subject to substantial stressing forces. In particular, the end plate or closure member of the cylinder between which and the piston the spring is compressed and the piston itself may be subject to especially large stresses. In order to reduce such stresses it is known to provide for the periphery of the piston to engage a stop when hold-off fluid pressure is applied to fully move the piston to its brake release position. In this way the force generated by the releasing pressure is not applied by the centre of the piston to centre of the end plate or cylinder closure. Nevertheless, if a mechanical wind-off mechanism is arranged to act axially of the piston and cylinder to compress the spring, this together with the mentioned stop acting upon the periphery of the piston may result in over stressing of the piston and/or the closure member of the cylinder through which the force of the wind-off mechanism is applied and this force may easily exceed forces which are applied by releasing air pressure.

According to the invention there is provided a fluid pressure operable actuator having a housing, a spring contained under compression between a closure member of the housing and a fluid pressure responsive member moveable therein the housing having both a first stop against which the periphery of the pressure responsive member can rest and a second stop carried by the closure member against which the centre of the pressure responsive member can rest when acted upon by fluid pressure in counteracting the force of the spring.

In order to ensure that the first and second stops are engageable substantially simultaneously by the pressure responsive means the second stop carried by the closure member is preferably an adjustable stop the position of which is set during assembly of the actuator.

By virtue of the first and second stops being effective substantially simultaneously the possibility of the piston or closure member being over-stressed by an applied brake releasing fluid pressure or by a mechanical wind-off mechanism is substantially reduced.

In order that the invention may be more clearly understood and readily carried into effect and the same will be further described by way of example with reference to the single figure of the accompanying drawing.

Referring to the drawing this illustrates the spring brake actuator portion of a combined spring brake and service brake actuator. The actuator has a housing consisting of a cast aluminium cylinder 1, with a closure member or head 2 between which and a pressure responsive member 3 there is provided a compressed heavy spring 4. The pressure responsive member 3 consists of a piston having a guide ring 5 and a compression seal which is slideable within a bore 7 of the cylinder, the piston has a central trunk 8 within which there is press-fitted a force output tube 9 the outer end of which passes through an axial bore with a guide ring 10 and a seal 11, this outer end having a pressed-in pressure pad 12 for acting on the rear of the dia ram 13 of the service actuator portion. The cylinder has a spring brake control pressure port 14 through which controlling pressure can be applied to drive the piston 3 against the force of the spring 4 until the periphery of the piston engages a stop 15 formed by the closure member. The closure member is retained in the cylinder in known manner by an annular circlip 23 engageable in a recess and a groove in the housing.

Threadedly located in a complimentarily screw-threaded bore 16 of the closure member there is provided an internally threaded tubular adjustable stop 17 provided with an external locking nut 18. A bolt 19 with a shoulder 20 provided at its head is threaded along its length and is screwed into the tubular stop 17 to be provided with a keyed-on nut 21 on the outer end.

During assembly of the actuator the stop 17 is initially loose such as to provide a clearance between it and the centre of the trunk 8 of the piston 3 when a releasing fluid pressure is applied at 14 to cause the piston to engage stop 15. The stop 17 is then screwed inwards until engagement occurs with the trunk 8, whereupon the nut 18 is tightened to lock the stop 17 into a final assembled position whereby during subsequent operation of the actuator substantially simultaneous engagement occurs between the periphery of the piston and stop 15 and the trunk of the piston and stop 17. A flexible plastic dirt extrusion cap 22 is snapped over the nut 18.

In operation of the actuator, upon release of fluid pressure the piston is movable under the action of the spring 4 to transmit a braking force through the tubular output member 9 to the back of the service actuator diaphragm to apply the brake. Recovery of the controlling force at port 14 will cause the piston 3 to come back to the position shown to release the brake. Since the periphery of the piston 3 makes contact with the stop 15, such pressure is counteracted mainly by the stop 15. In the event of no such fluid pressure being available for releasing the brake, as for example may be the case where the actuator is on a trailer or a vehicle system to which at least temporarily the source of fluid pressure is disconnected, the spring brake may be released after removing the flexible dust cover 22 by applying a spanner to the nut 21 to wind the bolt outwards to a point where the shoulder 20 engages the inside of

the trunk 8 whereby the force of the spring is transferred from tube 9 to the centre of the spring is transferred from tube 9 to the centre of the closure member 2 via bolt 19. By virtue of the simultaneous stopping of the piston at stops 15 and 17 even unnecessarily high forces applied to the bolt 19 will not introduce additional dangerous radial stresses in the piston 3 or the closure member 2.

## CLAIMS

1. A fluid pressure operable actuator having a housing, a spring contained under compression between a closure member of the housing and a fluid pressure responsive member moveable therein the housing having both a first stop against which the periphery of the pressure responsive member can rest and a second stop effective between the closure member and the centre of the pressure responsive member when acted upon by fluid pressure in counteracting the force of the spring.

2. A fluid pressure operable actuator as claimed in claim 1 wherein the second stop is a stop adjustable during assembly of the actuator.

3. A fluid pressure operable actuator as claimed in claim 1 or 2 wherein the second stop comprises a screw adjustable stop carried by the closure member.

4. A fluid pressure actuator substantially as described herein with reference to the accompanying drawing.

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